# A Unified Nonlinear Adaptive Approach for Detection and Isolation of Engine Sensor, Actuator and Component Faults, Phase II

Completed Technology Project (2009 - 2011)

## Project Introduction

Impact Technologies in collaboration with Pratt & Whitney and Wright State University, proposes to continue the development of an innovative nonlinear adaptive method for detecting and isolating sensor faults, actuator faults, and component faults for jet engines. In sharp contrast to many conventional methods which deal with either sensor faults or component faults but not both, our method considers all three types of faults under one unified framework. In the successful Phase I program, we have demonstrated the effectiveness of the approach via a proof-of-concept demonstration using NASA's C-MAPSS model. The objective of Phase II is to raise the TRL by comprehensive development/improvement of the prototype system, extensive performance evaluation, and close collaboration with Pratt & Whitney for technology transition. The success of this program will bring significant benefits to the propulsion industry by providing a cutting-edge engine diagnostics system with features that have never been available, including adaptive nonlinear engine model, adaptive threshold, transferrable-belief-model-based residual evaluation within a unified framework. These novel technologies will greatly improve performance of onboard engine diagnostics system especially during transient operations and further reduce false alarm rate and missed detection rate, resulting in improved flight safety and significant reduction in overall engine maintenance cost.

## Primary U.S. Work Locations and Key Partners
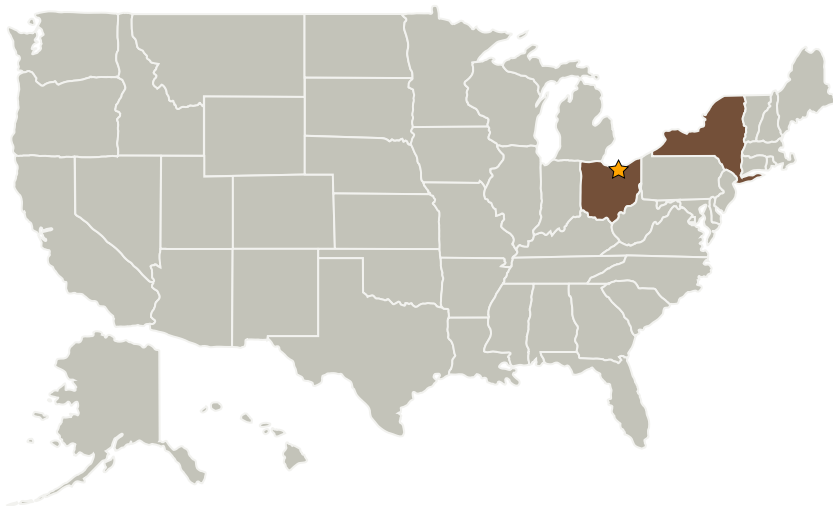




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**Small Business Innovation Research/Small Business Tech Transfer**

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ⭐Glenn Research Center(GRC) | Lead Organization | NASA Center | Cleveland, Ohio |
| Impact Technologies, LLC | Supporting Organization | Industry | Rochester, New York |

| Primary U.S. Work Locations | |
|---|---|
| New York | Ohio |

## Project Transitions

▶ **November 2009:** Project Start

✔ **November 2011:** Closed out

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Glenn Research Center (GRC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX13 Ground, Test, and Surface Systems
  └ TX13.2 Test and Qualification
    └ TX13.2.6 Advanced Life-Cycle Testing Techniques